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PROVISIONAL SPECIFICATION

Improvements in or relating to Infra-Red Electric Heating Apparatus.

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, London, W.C.2, a British Company, and FRANK HUGH MORRIS, of The General Electric Company, Ltd., Conduit Works, Witton, Birmingham, a British Subject, do hereby declare the nature of this invention to be as follows:—

This invention relates to infra-red electric heating apparatus of the kind in which infra-red electric lamps are used for baking and drying, for example for paint drying.

It is well known that infra-red electric ovens can be built up using a plurality of infra-red electric lamps, which may or may not have internal reflectors, in conjunction with a plurality of reflectors. If the lamps have internal reflectors, it is usual, in order to build up a continuous surface, to surround each lamp with a reflecting surface, the lamp projecting through or lying in a hole in the surface.

Various constructions of reflectors have been suggested for building up different sizes of ovens, some constructions including the features that adjacent reflectors interlock or interfit with one another, and blank reflectors, that is reflectors not directly associated with lamps, have been used in building up ovens.

One object of the present invention is the provision of a reflector which is particularly suited for the building up of different sizes of oven from standard parts whilst another object of the invention is the provision of infra-red electric heating apparatus which is relatively cheap to manufacture.

According to one aspect of the present invention, in a reflector for use in infra-red electric heating apparatus, at least one edge of the reflector is so arranged as to interfit or interlock with an edge of another reflector placed adjacent thereto and is provided with at least one slot or the like for the passage of a supporting rod or bar.

The reflector may be for association with an electric lamp or be a blank reflector; if for association with an electric lamp with an internal reflector, it may comprise an aper-

tured flat rectangular sheet of polished metal and, if for association with an infra-red lamp without an internal reflector, it may comprise a bowl shaped part within which the lamp lies and a flat rectangular edge part.

A reflector for use with internal reflector lamps according to a feature of the invention comprises a rectangular flat sheet of polished metal, provided with one or more apertures for one or more lamps, two opposing edges of which are formed so that they each provide at least one slot for a supporting rod and they interfit with a similar adjacent reflector.

The reflector may be of anodised aluminium and the aperture or one or more apertures may be closed by a removable insert or inserts.

According to another aspect of the invention, infra-red electric heating apparatus of the kind in which infra-red electric lamps are used, comprises at least two adjacent reflectors whose adjacent edges interfit or interlock and are each provided with a slot or slots for a supporting rod or bar.

In carrying the invention into effect, according to the example of construction, an infra-red electric oven using internal reflector lamps comprises two parts each mounted on its own wheeled base. Each part comprises five horizontal banks of twelve lamps one above the other and, in operation, the lamps of the two parts face inwardly generally towards each other. Horizontally, the lamp banks are divided into groups of four and with each four is associated one reflector, all the reflectors forming a continuous surface.

Each part is enclosed at the back of the lamps by sheet metal mounted on the framework of the part and the metal is apertured at the top so that air to the interior of the oven passes in through the apertures, down the back of the reflectors over the lamp caps and holders and up into the interior of the oven. This sheet metal back of each part also carries the necessary switch and fuse gear for the lamps.

The main supporting means for the re-

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reflectors and lamp holders is formed by a series of contour bars supported by the framework of each part. The contour bars are slotted flat strips which are secured with their lengths vertical but shaped to the required contour of the interior of the oven. Thus, in the oven being described, each contour bar is formed with a central portion which is truly vertical and corresponds to the three central horizontal banks of lamps and bottom and top end portions which are inclined to the central portion towards the central line of the oven; each end portion corresponds to one horizontal bank of lamps. The contour bars are suitably secured along the length of the oven, two to each group of four lamps and one at each end of the group.

Secured by screws to each contour bar at each end of a group of four lamps is an end support which has two arms in the shape of a "V." When an end support is secured to the contour bar, its arms project inwardly towards the centre line of the oven in a plane at right angles to the axis of the oven. At the bottom of the arms, each end support is provided with a lug bent at right angles to the plane of the support and the lugs of the two end supports at the ends of a group of four lamps serve as mountings for a length of channel which carries lamp holders for the lamps. The lamp holders are spring mounted, the holders being secured at two diametrically opposite points to a metal annulus which is itself secured at two other diametrically opposite points, 90° round the annulus from the other two points, to the channel. The leads to the lamps run through the channel and the lamps are suitably connected through the leads to the associated switch and fuse gear.

Each end support has an aperture in the free end of each arm thereof and, as will be appreciated, the corresponding apertures in the end supports line up along the horizontal banks. Through each line of apertures passes a supporting rod which also passes through the two end walls of the oven part and have threaded ends carrying fixing units. The supporting rods carry the lamp reflectors and each reflector for four lamps comprises a flat rectangular plate of anodised aluminium having four apertures in line for the lamps. The edges of the apertures are chamfered so that a lamp cannot fall right through the reflector aperture and must be placed in its holder from the front, that is the interior of the oven, and the chamfered edges carrying loops of asbestos string to ensure that the hot glass of the lamp does not touch the cooler metal of the reflector. If desired, metal inserts provided with spring clips may be fitted into the apertures if all the lamps are not required.

The horizontal edges of adjacent reflectors interfit with one another but the vertical edges do not, the shorter ends of a reflector being

merely turned over inwardly away from the front surface thereof at a right angle. The longer edges, in order that adjacent reflectors may interfit, are specially shaped one edge having approximately half its length in the centre turned over rearwardly to form a slot, the remaining end parts being pressed rearwardly to form a lip. The other edge has the central part pressed rearwardly to form a lip and the end parts formed as slots, and the dimensioning of the slots and lips is such that a lip or lips fits closely over a slot or slots when two reflectors are placed edge to edge together.

The supporting rods pass with a sliding fit through the slots in the reflectors and, as will be appreciated, the reflectors are supported by their edges and the adjacent reflectors interfit. Top and bottom reflectors, unprovided with apertures, are associated with the banks of lamp reflectors of each oven part and these reflectors are suitably formed to interfit with the adjacent lamp reflectors. If desired, any lamp reflector may be replaced by a blank reflector also having suitably shaped horizontal edges.

As will be appreciated from the above description, many forms of oven can be built up using standard units and the units may also be used for the construction of a top heating part for association with two side heating parts.

In a modified construction, in order that the angle of inclination of the bottom and top horizontal banks of lamps may be adjustable after the oven parts are built up, the end supports and lamp holder channels are movable through a limited angle. For this purpose, for each group of four lamps in a bottom or top bank, there is provided a pair of quadrant brackets secured, one at each end of the row of four lamps, to the framework of the oven part and the adjacent contour bar. Each bracket has a part which lies in the vertical plane and which is provided with an arcuate slot; this slot acts as a guide for a bolt which is secured to the adjacent end support and which is provided with a ring nut for clamping purposes. The support for the bank of four lamps is through the said bolts, one at each end of the bank, and the end supports carrying the lamp holder channel, the supporting rods and the lamp reflector. One edge of the reflector will interfit with the adjacent lamp reflector whilst a bottom (or top as the case may be) reflector slides through hooked lugs carried by the adjacent supporting rod and is linked at its ends to the quadrant bracket by two links which carry studs sliding in horizontal slots in the contour bracket. The inclination of the bottom (or top) reflector is controlled, therefore, by the inclination of the adjacent lamp bank and the said studs in the slots in the quadrant brackets. Means are provided

for locking the studs in position.

In the constructions of \odot described above, the main framework may be built up of light angle iron with the sheet metal secured thereto. The total length of an oven may be varied by using either different numbers of oven parts as described, or by varying the number of lamps in a horizontal bank in

an oven. By the use of sheet metal the lamps are completely shrouded at the rear 10 whilst air is forced to flow over the lamp caps before passing into the oven.

Dated the 24th day of October, 1946,

For the Applicants:

F. S. PEACHEY,
Chartered Patent Agent.

COMPLETE SPECIFICATION

Improvements in or relating to Infra-Red Electric Heating Apparatus

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, 15 London, W.C.2, a British Company, and FRANK HUGH MORRIS, of The General Electric Company Limited, Conduit Works, Witton, Birmingham, a British Subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to infra-red electric 25 heating apparatus of the kind in which infra-red electric lamps are used for baking and drying, for example for paint drying.

It is well known that infra-red electric ovens can be built up using a plurality of 30 infra-red electric lamps, which may or may not have internal reflectors, in conjunction with a plurality of reflectors. If the lamps have internal reflectors, it is usual, in order to build up a continuous surface, to surround 35 each lamp with a reflecting surface, the lamp projecting through or lying in a hole in the surface.

Various constructions of reflectors have been suggested for building up different sizes 40 of ovens, some constructions including the features that adjacent reflectors interlock or interfit with one another, and blank reflectors, that is reflectors not directly associated with lamps, have been used in building up ovens.

One object of the present invention is the 45 provision of a reflector which is particularly suited for the building up of different sizes of oven from standard parts whilst another object of the invention is the provision of 50 infra-red electric heating apparatus which is relatively cheap to manufacture.

According to one aspect of the present invention, a reflector for use in infra-red electric heating apparatus, has two parallel edges, 55 the reflector being adapted to be supported at each of these edges by a rod or bar lying parallel thereto and the edges being shaped so as to interfit or interlock with the edges of similar reflectors placed adjacent thereto so that, when two reflectors are interfitted or 60 interlocked in this manner, they may be supported at the adjacent edges by a single rod or bar.

If the reflector is for use with a mushroom-

shaped infra-red electric lamp having an internal reflector, it may comprise a flat rectangular sheet of metal apertured to receive the bulb of the lamp. A plurality of similar apertures may be provided in a single line parallel to the edges of the reflector and at 70 least one of these apertures may be closed by a removable insert.

Alternatively, if the reflector is for use with a mushroom-shaped infra-red electric lamp without an internal reflector it may comprise 75 a bowl-shaped part within which the lamp may lie and flat rectangular edge parts on either side of the said bowl part the reflector being of metal.

The reflector may be of anodised 80 aluminium.

According to another aspect of the invention, infra-red electric heating apparatus of the kind in which infra-red electric lamps are used, includes at least two reflectors, each 85 reflector having two parallel edges and the reflectors being supported at these edges by a rod or bar lying parallel thereto, the said edges of adjacent reflectors being shaped to interfit or interlock with one another so that 90 they are supported at adjacent edges by a single rod or bar.

One example of construction of an infra-red electric oven using internal reflector lamps will now be described with reference to 95 the five figures of the accompanying drawings, in which:—

Fig. 1 is an end elevation of the oven, partly in section, showing the general construction; 100

Fig. 2 shows a view at line II—II in Fig. 1;

Fig. 3 shows in detail the method of mounting one lamp and reflector;

Fig. 4 shows an isometric view of one reflector element, and 105

Fig. 5 shows a modification of part of the oven.

Referring to Figs. 1 and 2, an infra-red electric oven 1 using internal reflector lamps 110 2 comprises two parts 3 and 4 each mounted on its own wheeled base. Each part 3 or 4 comprises five horizontal banks 5-9 one above the other of twelve lamps each and, in operation, the lamps 2 of the two parts 3 and 4 115 face inwardly generally towards each other.

Horizontally, lamp banks 5-9 are divided into three groups 17, 18 and 19, of four lamps 2 each, each group of four lamps 2 being associated with one reflector 10, all the reflectors 10 forming a continuous surface.

Each part 3 or 4 is enclosed at the back of the lamps 2 by sheet metal 11 mounted on the framework 12 (only partly shown) of the part 3 or 4. The metal 11 is provided with louvres 13 at the top to allow the free escape of air which enters at the unenclosed bottom of the part 3 or 4 and passes up the back of the reflectors 10 over the lamp caps 14 and holders 15 (see Fig. 3) and prevents an excessive rise in temperature of these components. The sheet metal back 11 of each part 3 or 4 also carries on its side remote from the lamps 2 the necessary switch and fuse gear (not shown) for the lamps 2.

The main supporting means for the reflectors 10 and lamps 2 is formed by a series of contour bars 16 supported by the framework of each part 3 or 4. The contour bars 16 are slotted flat strips which are secured with their lengths vertical but shaped to the required contour of the interior of the oven 1. Thus, in the oven being described, each contour bar 16 is formed with a central portion which is truly vertical and corresponds to the three central horizontal banks 6, 7 and 8 of lamps 2 and bottom and top end portions which are inclined to the central portion towards the central line 22 of the oven 1; each end portion corresponds to one horizontal bank 5 or 9 of lamps 2. The contour bars 16 are suitably secured along the length of the oven 1, two to each group 17, 18 and 19 of four lamps 2, one at each end of the group.

Referring also to Fig. 3, secured by screws 20 to each contour bar 16 at each end of a group 17, 18 or 19 of four lamps 2 is an end support 21 which has two arms 23 and 24 in the shape of a "V." When an end support 21 is secured to the contour bar 16, its arms 23 and 24 project inwardly towards the centre line 22 of the oven 1 in a vertical plane. At the junction of the arms 23 and 24, each end support 21 is provided with a lug (not shown) bent at right angles to the plane of the support 21 and the lugs of the two end supports 21 at the ends of a group 17, 18 or 19 of four lamps 2 serve as mountings for a length of channel 26 which carries lamp holders 15 for the lamps 2. The lamp holders 15 are spring mounted, each holder being secured at two diametrically opposite points to a metal annulus 27 which is itself secured through the resilient mounting 28 to the channel 26. The leads 29 to the lamps 2 run through the channel 26 and the lamps 2 are suitably connected through the leads 29 to the previously mentioned associated switch and fuse gear.

Each end support 21 has an aperture in the free end of each arm 23 and 24 and, as

will be appreciated, corresponding apertures in the end supports 21 of adjacent groups 17, 18 and 19 line up along the horizontal banks 5-9. Through each line of apertures passes a supporting rod 30 which also passes through the two end walls 31 of the oven part 3 or 4 and have threaded ends carrying fixing nuts 32. The supporting rods 30 carry the lamp reflectors 10 and each reflector 10 for four lamps 2 comprises a flat rectangular plate of anodised aluminium having four apertures 33 in line for the lamps 2. The edges of the apertures 33 are chamfered so that a lamp 2 cannot fall right through the reflector aperture and a lamp 2 must be placed in its holder 15 from the front of the reflector 10, that is the interior of the oven 1, and the chamfered edges carrying loops 34 of asbestos string to ensure that the hot glass of the lamp 2 does not touch the cooler metal of the reflector 10. If it is not desired to have a lamp 2 in every aperture 33 those apertures 33 not associated with a lamp 2 may be covered by a metal insert (not shown) to give a continuous reflector surface. The metal inserts may be held in position by spring clips.

Referring also to Fig. 4, the long edges 35 and 36, horizontal in this example, of adjacent reflectors 10 interfit with one another but the short edges 37 and 38 do not, being merely turned over backwardly away from the front surface thereof at a right angle. The longer edges 35 and 36, in order that adjacent reflectors 10 may interfit, are specially shaped the edge 35 having approximately half its length in the centre turned over rearwardly to form a tubular beading 39, the remaining end parts being pressed rearwardly to form lips 40. The other edge 36 has the central part pressed rearwardly to form a lip 41 and the end parts formed as tubular beading 42, and the dimensioning of the beading and lips is such that a lip or lips fits closely over the beading when two reflectors 10 are placed edge to edge together.

The supporting rods 30 pass with a sliding fit through the beading 39 and 42 in the reflectors 10 and, as will be appreciated, the reflectors 10 are supported by their edges 35 and 36 and the adjacent reflectors 10 interfit. Top and bottom reflectors 43 and 44, unprovided with apertures, are associated with the banks 5-9 of lamp reflectors of each oven part 3 and 4 and these reflectors 43 and 44 are suitably formed to interfit with the adjacent lamp reflectors 10. If desired, one or more lamp reflector 10 in the oven 1, may be replaced by a blank reflector, that is to say an unapertured reflector, also having similarly shaped horizontal edges which interfit in the manner described above.

As will be appreciated from the above description, many forms of oven can be built up using standard units and the units may 180

also be used for the construction of a top heating part for association with two side heating parts.

Referring now to Fig. 5, the modified construction, in order that the angle of inclination of the bottom and top horizontal banks of lamps 2 may be adjustable after the oven parts 8 or 4 are built up, the end supports 21 and lamp holder channels 26 are movable through a limited angle. For this purpose, for each group of four lamps in a bottom bank, there is provided a pair of quadrant brackets 45 secured, one at each end of each group of four lamps 2 in the row 5, to the framework 12 of the oven part 8 or 4 and the adjacent contour bar 16. Each bracket 45 has a part 46 which lies in the vertical plane and which is provided with an arcuate slot 47; this slot 47 acts as a guide for a bolt 48 which is secured to the adjacent end support 21 and which is provided with a wing nut (not shown) for clamping purposes. The support for the group of four lamps 2 is through the bolts 48, one at each end of the group, and the end supports 21 carrying the lamp holder channel 26, the supporting rods 80 and the lamp reflector 10. The upper edge of the reflector 10 will interfit with the adjacent lamp reflector whilst the bottom reflector 44 slides through hooked lugs 49 carried by the adjacent supporting rod 80 and is linked at its ends to the quadrant bracket 45 by two links 50, only one of which can be seen in Fig. 5, which carry studs 51 sliding in horizontal slots 52 in the quadrant bracket 45. The inclination of the bottom reflector 44 is controlled, therefore, by the inclination of the adjacent lamp group and the studs 51 in the slots 52 in the quadrant brackets 45. Means (not shown) are provided for locking the studs 51 in position. It will be appreciated that the row 9 of lamps 2 adjacent the top reflector 48 may be adjustable in like manner.

In the constructions of oven 1 described above, the main framework may be built up of light angle iron with the sheet metal 11 forming the outside of the parts 8 and 4 secured thereto. The total length of an oven may be varied by using either different numbers of oven parts as described or by varying the number of lamps in a horizontal bank in an oven. By the use of sheet metal, the lamps are completely shrouded at their rear whilst air is forced to flow over the lamp caps before passing into the oven.

The example of construction of an infra-red electric oven described above is for use with lamps having internal reflectors but the invention is not restricted to ovens using this type of lamp. In the case of an oven for use with lamps without internal reflectors, the lamp reflectors may be bowl-shaped and provided with apertures to permit only the contacts and neck of each lamp to pass through

and so arranged that lamps are, in effect, inside the oven.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A reflector for use in infra-red electric heating apparatus, having two parallel edges, the reflector being adapted to be supported at each of these edges by a rod or bar lying parallel thereto and the edges being shaped so as to interfit or interlock with the edges of similar reflectors placed adjacent thereto so that, when two reflectors are interfitted or interlocked in this manner, they may be supported at the adjacent edges by a single rod or bar.

2. A reflector as claimed in Claim 1 and for use with a mushroom-shaped infra-red electric lamp having an internal reflector; said first reflector comprising a flat rectangular sheet of metal apertured to receive the bulb of the lamp.

3. A reflector as claimed in Claim 2, wherein there are provided a plurality of similar apertures disposed in a single line parallel to the said edges of the reflectors.

4. A reflector as claimed in Claim 3, wherein at least one of the said apertures is closed by a removable insert.

5. A reflector as claimed in Claim 1 and for use with a mushroom-shaped infra-red electric lamp without an internal reflector, comprising a bowl-shaped part within which the lamp may lie and flat rectangular edge parts on either side of the said bowl part, the reflector being of metal.

6. A reflector as claimed in any one preceding claim, wherein the said reflector is of anodised aluminium.

7. An infra-red electric heating apparatus of the kind in which infra-red electric lamps are used, including at least two reflectors, each reflector having two parallel edges and the reflectors being supported at each of these edges by a rod or bar lying parallel thereto, the said edges of adjacent reflectors being shaped to interfit or interlock with one another so that they are supported at adjacent edges by a single rod or bar.

8. An infra-red electric heating apparatus as claimed in Claim 7, wherein, in order to define the reflecting surface formed by the said reflectors, the supporting bars are connected to one or more contour bar or bars.

9. An infra-red electric heating apparatus as claimed in Claim 8, wherein means are provided for adjusting the angle of inclination with respect to the said contour bar or bars of a reflector having only one edge which interfits or interlocks with the edge of an adjacent reflector.

10. A reflector for use in infra-red electric heating apparatus substantially as hereinbefore described with reference to Fig. 4 of

the accompanying drawings.

11. An improved electric heating apparatus substantially as hereinbefore described with reference to Figs. 1, 2 and 3; or Figs. 1, 2, 3 and 5 of the accompanying drawings.

Dated the 28th day of January, 1948.

For the Applicants,
F. S. PEACHEY,
Chartered Patent Agent.

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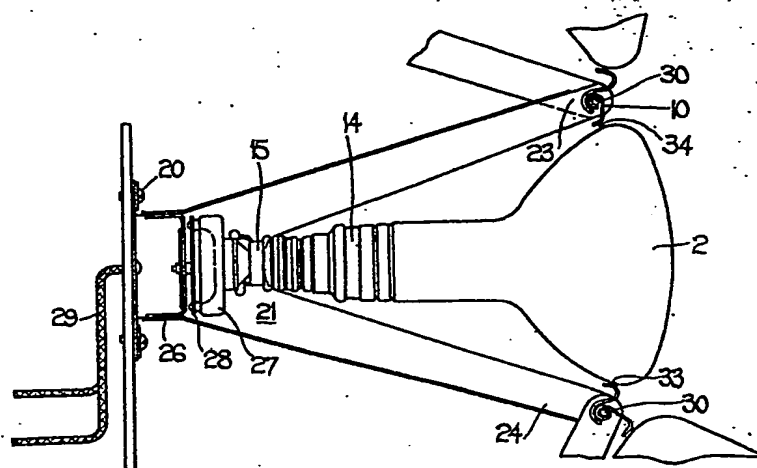


FIG.3.

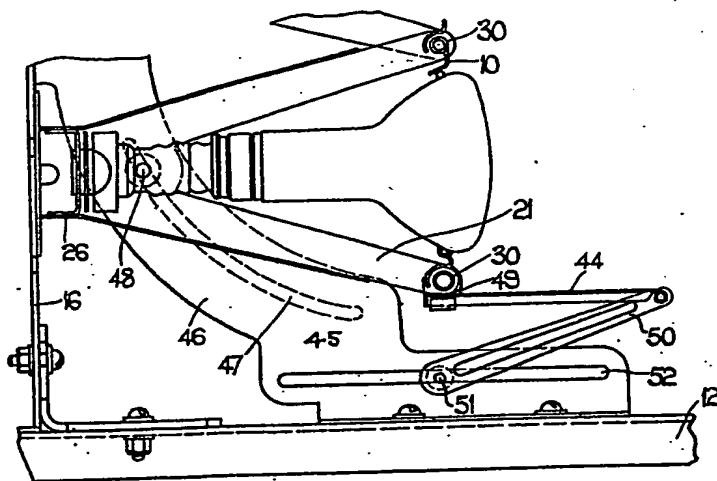
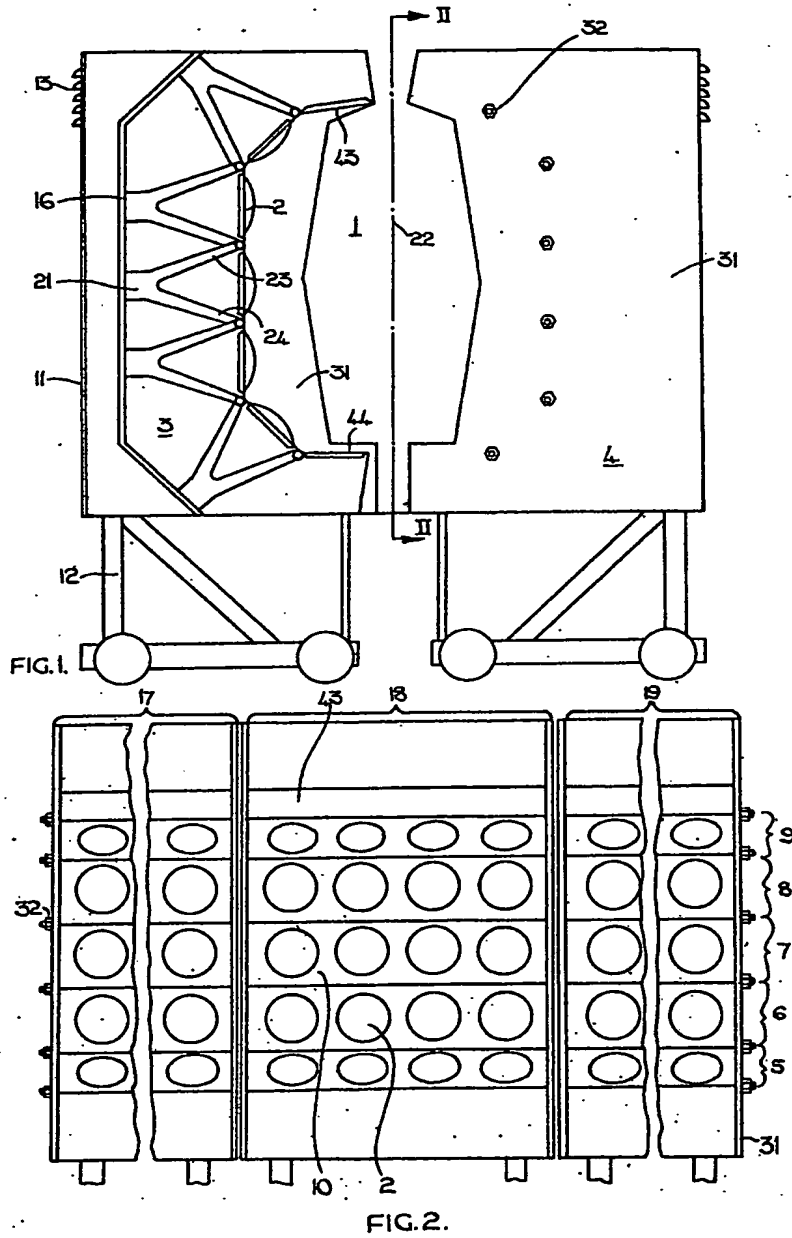


FIG.5.

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FIG. 1. COMPLETE SPECIFICATION

SHEET 1

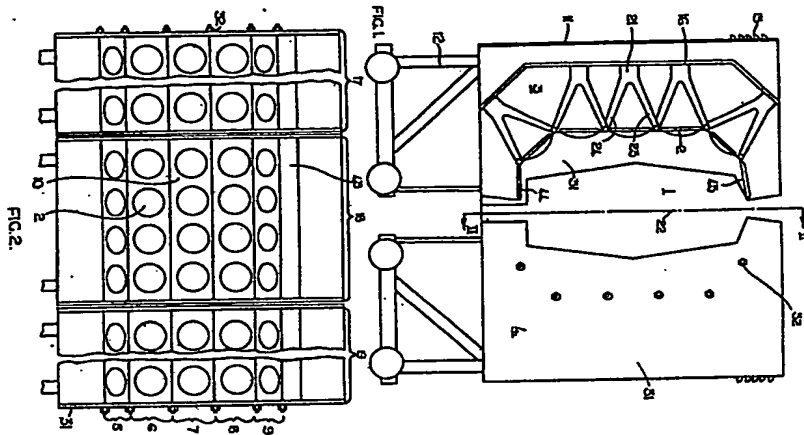


FIG. 3

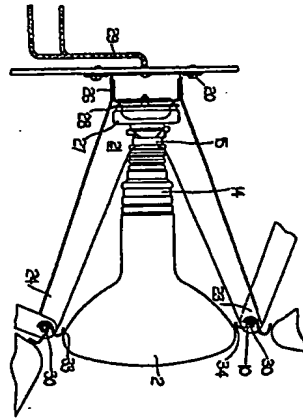
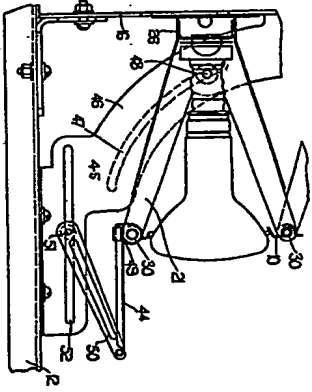


FIG. 5



3 SHEETS
SHEET 3

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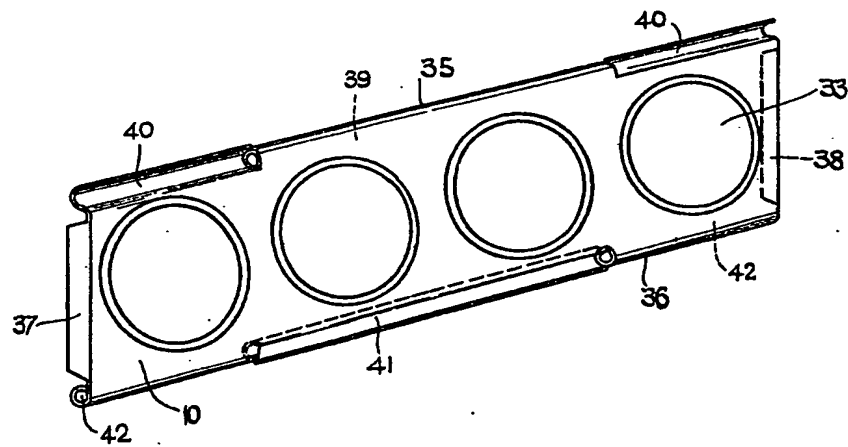


FIG. 4

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